

Liquid Chromatograph Mass Spectrometer

# LCMS-8050

*UFMS*  
ULTRA FAST MASS SPECTROMETRY



Speed and



 SHIMADZU

LCMS-8050  
LIQUID CHROMATOGRAPH MASS SPECTROMETER

 POWER

 STATUS

 HEATER

 GAS

 HV

# Sensitivity Beyond Comparison

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Continuing the evolution of Shimadzu's UF technology, Shimadzu introduces the LCMS-8050 triple quadrupole mass spectrometer, offering unparalleled measurement speeds and high-sensitivity performance.

High-sensitivity quantitation delivered at high speed

Multi-component analysis performed more rapidly

Simultaneous qualitative and quantitative analyses

The high performance of the LCMS-8050 defies expectations, redefining high-sensitivity, high-speed analysis.



# Experience a New Realm of High-Sensitivity & High-Speed Performance

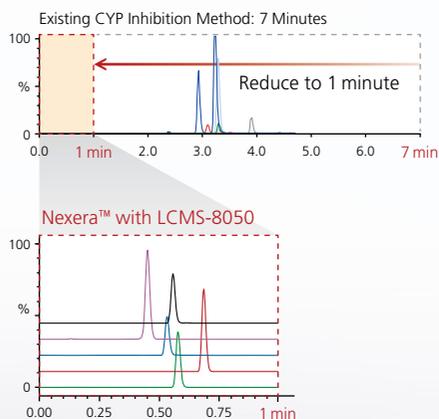


UFsensitivity™  
Combining Speed and High Sensitivity

## UFswitching™ ■ High-Sensitivity & High-Speed Positive/Negative Ionization Switching in 5 msec

### A Case Study Using High-Speed Positive/Negative Ionization Switching

High-speed polarity switching has a high impact on LC-MS/MS method design and capability by optimizing the signal response for each target compound resulting in a single injection analysis cycle, faster rates of sample throughput and a greater number of target compounds in a single method.



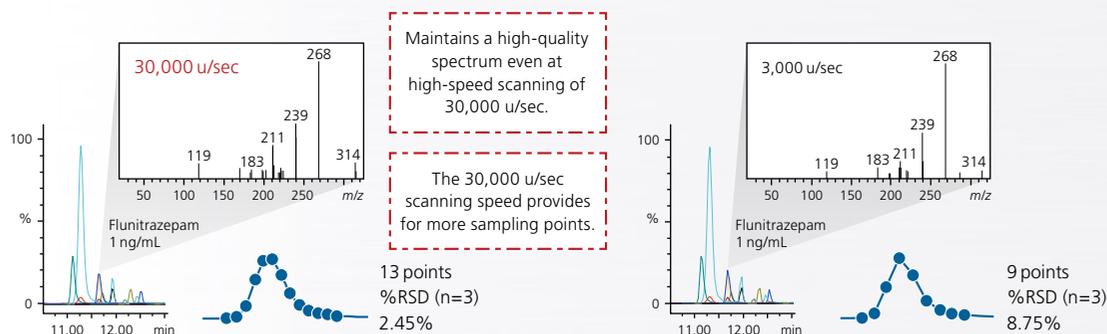
High-speed polarity switching pushes the boundaries further;

- Supports high data sampling rates delivering over 20 points across a UHPLC peak
- Improves reproducibility even at the lowest calibration level
- Enhanced dynamic range compared to other triple quadrupoles

Compound	Polarity	Legacy HPLC Method 7 min			Nexera with LCMS-8050 1 min		
		Dynamic range (nmol/L)	Points/peak	%RSD 0.6 nmol/L (n = 4)	Dynamic range (nmol/L)	Points/peak	%RSD 0.6 nmol/L (n = 4)
Resorufin	+	0.6–300	19	4.66	0.6–1000	21	4.30
1'-Hydroxy Bufuralol	+	0.6–300	21	2.39	0.6–1000	24	1.82
(+/-)-4'-Hydroxy Mephenytoin	+	0.6–300	20	2.75	0.6–1000	23	2.18
Oxidized Nifedipine	+	0.6–300	19	5.58	0.6–1000	23	5.07
Hydroxy Tolbutamide	-	0.6–300	20	5.68	0.6–1000	23	2.96

## Simultaneous Quantitative and Qualitative Analysis Simultaneous High-Speed Screening of 12 Toxicological Drugs

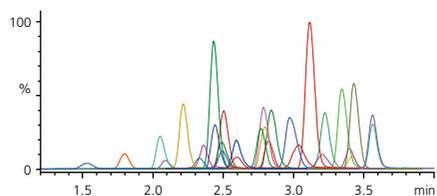
The LCMS-8050 is capable of simultaneously obtaining both qualitative and quantitative information in a single analysis. Acquisition occurs so rapidly that MS/MS scans and MRM measurements can be performed concurrently while maintaining quantitative accuracy. MS/MS scans are usable and reliable because even at 30,000 u/sec, Shimadzu uses a 0.1 u scan step.



MRM Triggered Product Ion Scanning of a Mixture of 12 Benzodiazepines (1 ng/mL each)

## Detect Target Compounds at Trace-Level Concentrations Simultaneous Analysis of 29 Pesticides for Water Quality Analysis

The LCMS-8050 is capable of simultaneously acquiring 555 MRM transitions per second without sacrificing accuracy and precision. A high sampling rate delivers precise and accurate quantitation for quantitation ions, reference ions, and internal standard ions even in chromatographic regions with unresolved peaks. The high sensitivity of the LCMS-8050 allows for trace-level analysis, such as pesticides in drinking water, without the need for sample pre-concentration. This high sensitivity is maintained even when monitoring large panels of target compounds.



MRM Chromatogram of 29 Pesticides  
for Water Quality Analysis (100 pg/mL each)

LCMS-8050 has achieved LOQs that fulfill the 1/100 target value without sample pre-concentration.

No.	Compound	LOQ pg/mL	1/100 of target pg/mL*	No.	Compound	LOQ pg/mL	1/100 of target pg/mL*
1	Thiuram	2.0	200	16	MPP oxon sulfoxide	4.2	10
2	Bentazone	3.9	2000	17	MPP oxon sulfone	5.7	10
3	Carbofuran	1.6	50	18	Dymron	0.65	8000
4	2,4-D	46.7	300	19	Methomyl	2.3	300
5	Triclopyr	45.3	60	20	Probenazole	5.2	500
6	Iprodione	1.7	3000	21	Diuron (DCMU)	0.7	200
7	Asulam	2.3	2000	22	Bensulfuron-methyl	4.4	4000
8	Bensulide	4.8	1000	23	Tricyclazole	2.7	800
9	Mecoprop (MCPP)	6.1	50	24	Azoxystrobin	2.7	5000
10	Carbaryl (NAC)	2.3	500	25	Halosulfuron-methyl	0.52	3000
11	Carpropamid	1.3	400	26	Flazasulfuron	0.47	300
12	Fenthion (MPP)	3.1	10	27	Thiodicarb	3.4	800
13	MPP sulfoxide	1.7	10	28	Siduron	0.82	3000
14	MPP sulfone	5.1	10	29	Fipronil	4.7	5
15	MPP oxon	4.9	10				

\*Note: Official analytical methods require detection to 1/100th of regulatory targets.



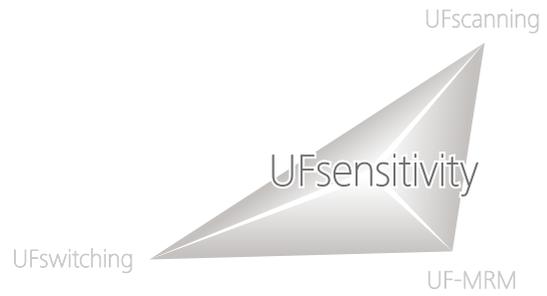
## UFsensitivity

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### High Sensitivity for Trace Quantitative Analysis

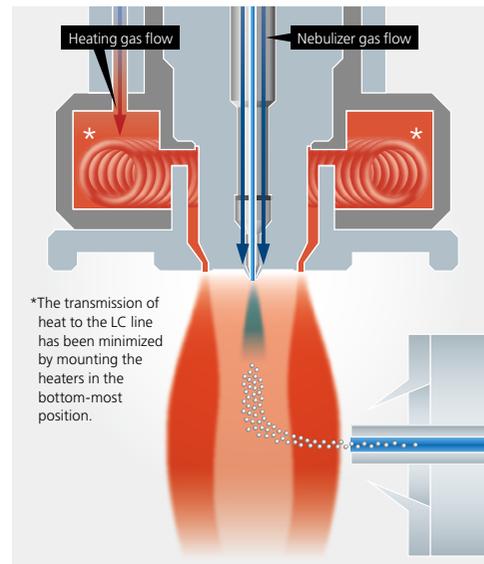
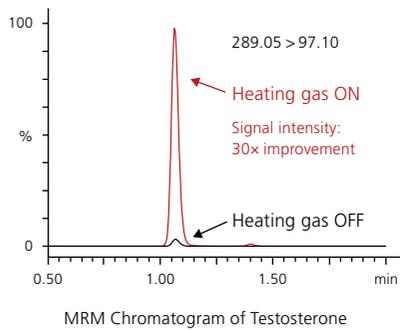
Scientists who demand trace-level quantitation will benefit from a newly designed heated ESI probe and a new high-efficiency CID cell, the UFsweeper™ III.

These technological improvements combined with Shimadzu's patented ion optics system deliver robust high-sensitivity performance.



## ■ Heated ESI Probe

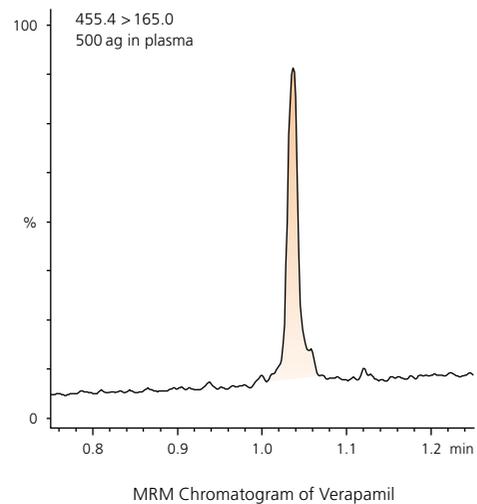
In order to improve desolvation efficiency, the newly developed heated ESI probe combines a high-temperature gas with the nebulizer spray, assisting in the desolvation of large droplets and facilitating ionization. This development allows for high-sensitivity analysis of a wide range of target compounds.



## ■ Excellent Reproducibility Even at Attogram (ag) Levels

Both sensitivity and reproducibility are essential when establishing low limits of quantitation. High-precision quantitative results obtained with the LCMS-8050 in the analysis of Verapamil in blood plasma at levels between 500 ag and 50 pg are shown below. Excellent reproducibility with a % RSD of 2.77 % was obtained when analyzing just 500 ag of Verapamil. The LCMS-8050 demonstrates optimal performance for quantitative analysis of even trace components of a complex matrix.

Concentration actual ng/mL	Calculated concentration ng/mL	% RSD (n = 6)	Accuracy (%) (n = 6)
0.000500	0.000501	2.77	100.2
0.00500	0.00496	3.98	99.2
0.0500	0.0506	1.21	101.2
0.500	0.493	1.31	98.6
5.00	4.89	1.81	97.8
50.0	51.6	0.65	103.2





# UFswitching

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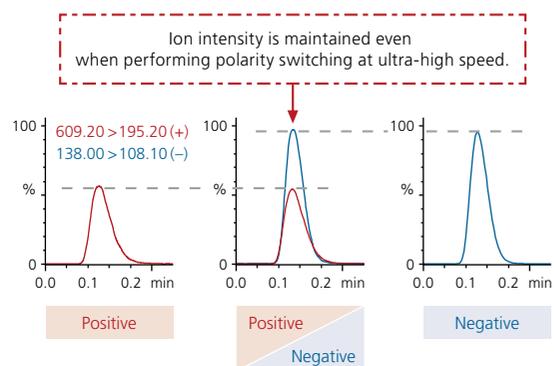
## Polarity Switching Technology with No Compromise in Quality or Sensitivity

Ultra-high speed positive/negative ionization switching technology [ UFswitching ] maintains constant data quality and sensitivity with no loss of quantitative accuracy. Laboratories can now use a single method for both positive and negative ions, increasing sample throughput and saving method development time.



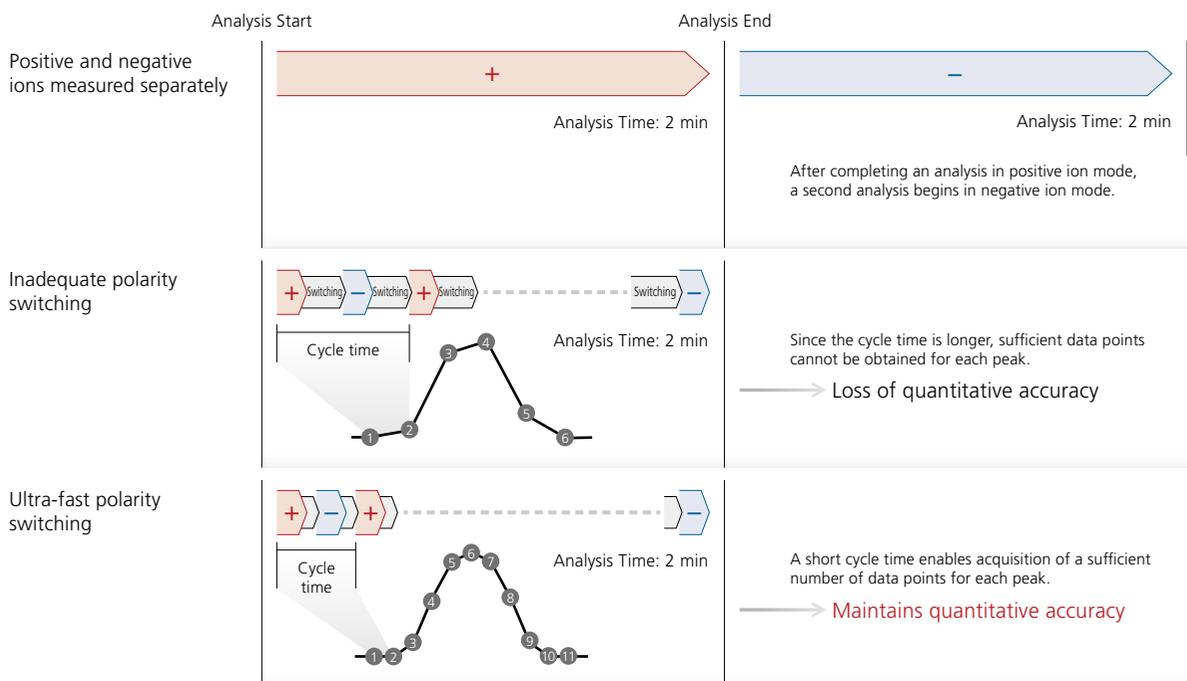
### ■ Only 5 msec to Achieve Stable Quantitative Accuracy with Positive/Negative Ionization Switching

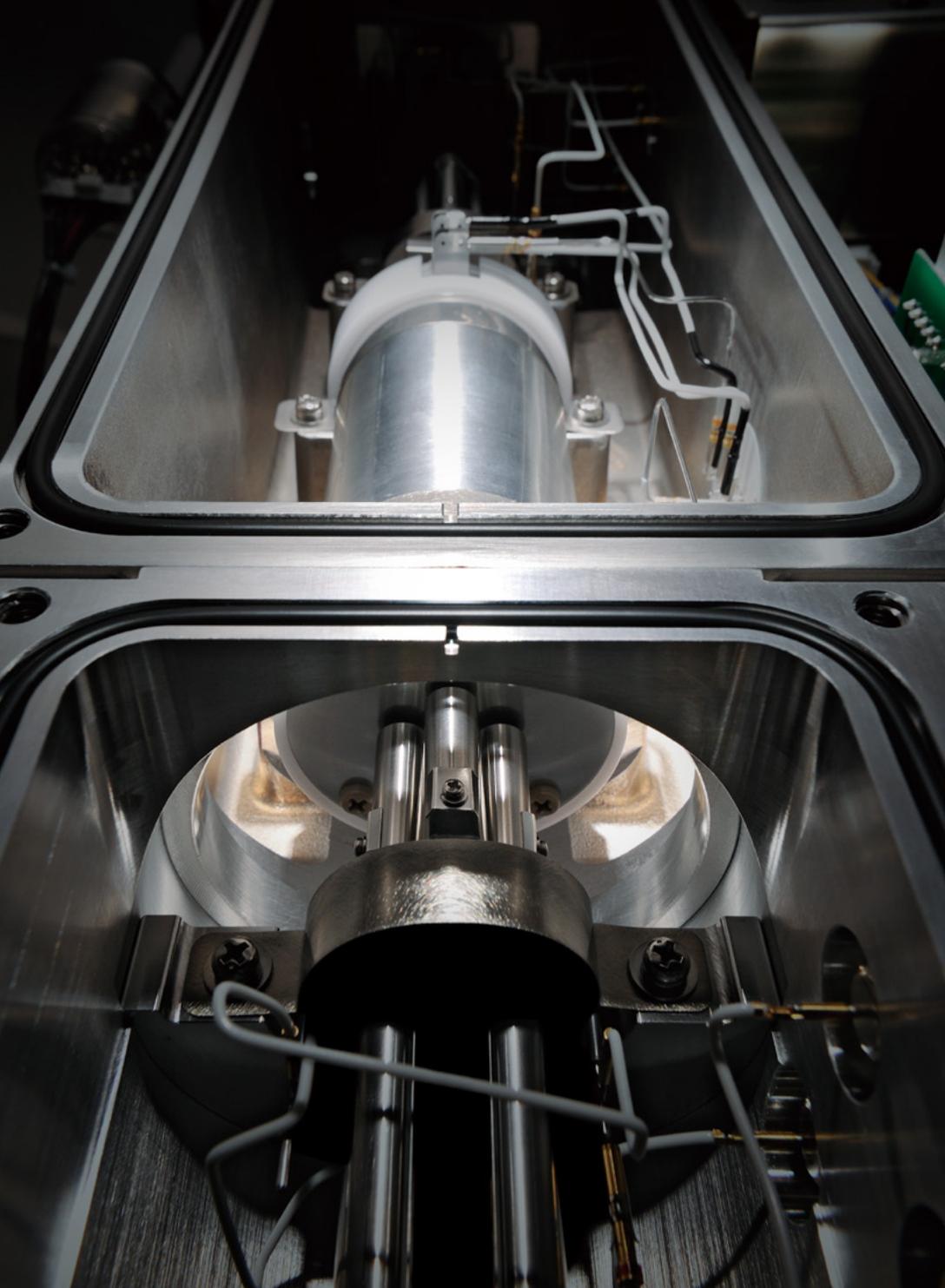
The LCMS-8050 uses unique high-voltage power supply technology to achieve an ultra-high-speed positive/negative ionization switching time of just 5 msec. The LCMS-8050 is also the only instrument of its type to maintain ion intensity even when performing polarity switching at ultra-high speed, yielding consistent, reproducible data. Excellent quantitative results can be obtained from UHPLC peaks no more than 2–3 seconds wide, even when multiple components are eluted simultaneously.



Comparison of measurement using the ultra-fast polarity switching (5 msec) and individual measurement of positive and negative ions.

### ■ Outstanding Throughput and Quantitative Accuracy



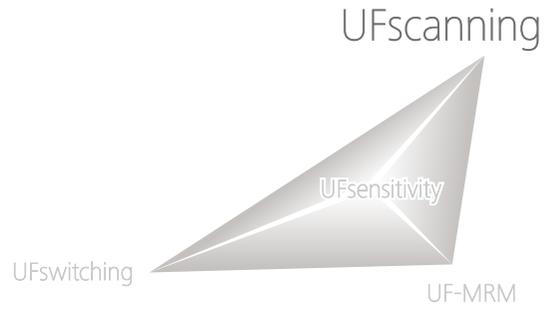


## UFscanning

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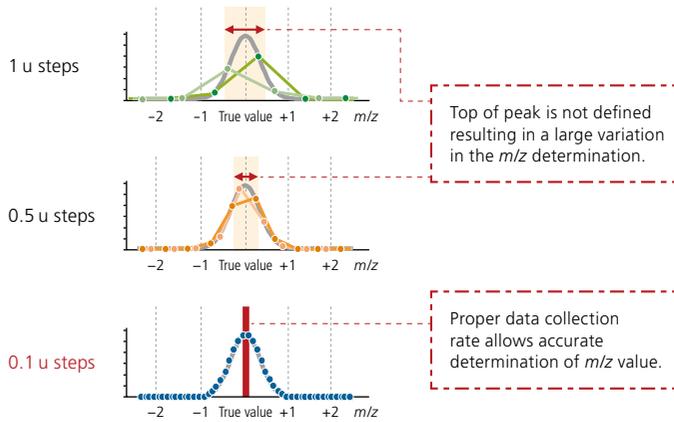
### Simultaneous, Highly Reliable Quantitative and Qualitative Analysis

With the development of a unique approach to ultra-high-speed scan technology [UFscanning], the LCMS-8050 maintains spectrum quality and ion intensity at any scan speed. Perform quantitative and qualitative analysis simultaneously with a maximum high-speed scan rate of 30,000 u/sec.

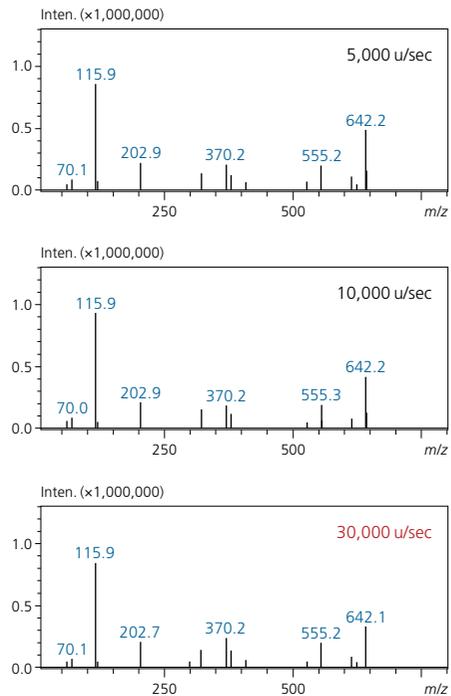


## ■ Maintain Sensitivity and Mass Accuracy Even at 30,000 u/sec

Greater ion transmission at any scan speed has been achieved by precisely controlling the voltage applied to the quadrupoles across the mass scale. As Shimadzu quadrupole technology using a data collection interval of 0.1 u high quality mass spectra are acquired without loss of sensitivity or mass accuracy.



Variation in  $m/z$  Caused by Different Sampling Intervals for Spectral Data



Bradykinin (MW 756.4) Product Ion Scan Spectrum  
Precursor Ion  $m/z$  379.4

## ■ Efficient Qualitative Analysis Using Synchronized Survey Scan™

The Synchronized Survey Scan (SSS) function allows MRM acquisition to be combined with other scan modes including library searchable spectra using a MRM triggered product ion scan.

One thousand events can be registered within a single method supporting the analysis of large panels of target compounds with high data quality and greater information.

Type	Event#	+/-	Compound Name	$m/z$	Time (6.647 min - 14.137 min)
MRM	1	+	zolpidem M-1	338.15>265.10	
- Product Ion Scan	2	+	zolpidem M-1	100.00 > 50.00>340.00	
MRM	3	+	7-aminoflurazepam	252.10>121.05	
- Product Ion Scan	4	+	7-aminoflurazepam	100.00 > 50.00>260.00	
MRM	5	+	7-aminoclozapem	286.05>121.20	
- Product Ion Scan	6	+	7-aminoclozapem	100.00 > 50.00>290.00	
MRM	7	+	N-desmethylboplicone	376.20>245.10	
- Product Ion Scan	8	+	N-desmethylboplicone	100.00 > 50.00>380.00	
MRM	9	+	7-aminoflurazepam	284.10>136.10	
- Product Ion Scan	10	+	7-aminoflurazepam	100.00 > 50.00>290.00	

An Example Method for Performing an MRM-Triggered Product Ion Scan

## UF Technologies Combine Sensitivity and High Speed

The LCMS-8050 combines the following technologies to ensure highly sensitive, high-speed performance:

[UFsensitivity] achieves high-sensitivity performance utilizing a new heated ESI probe and new UFsweeper III collision cell.

[UFswitching] high-speed positive/negative ionization switching and high-speed MRM [UF-MRM] maintain data quality and sensitivity.

[UFscanning] high-speed scan rate obtains high-quality mass spectra, even during high-speed analysis.

### ■ Heated ESI Probe

High-temperature gas supplements the nebulizer gas, improving desolvation efficiency. This facilitates the ionization of a wide range of compounds.

### ■ Ionization Unit

Designed without cables or tubes; utilize a one-touch lever to perform simple attachment and detachment of the unit.

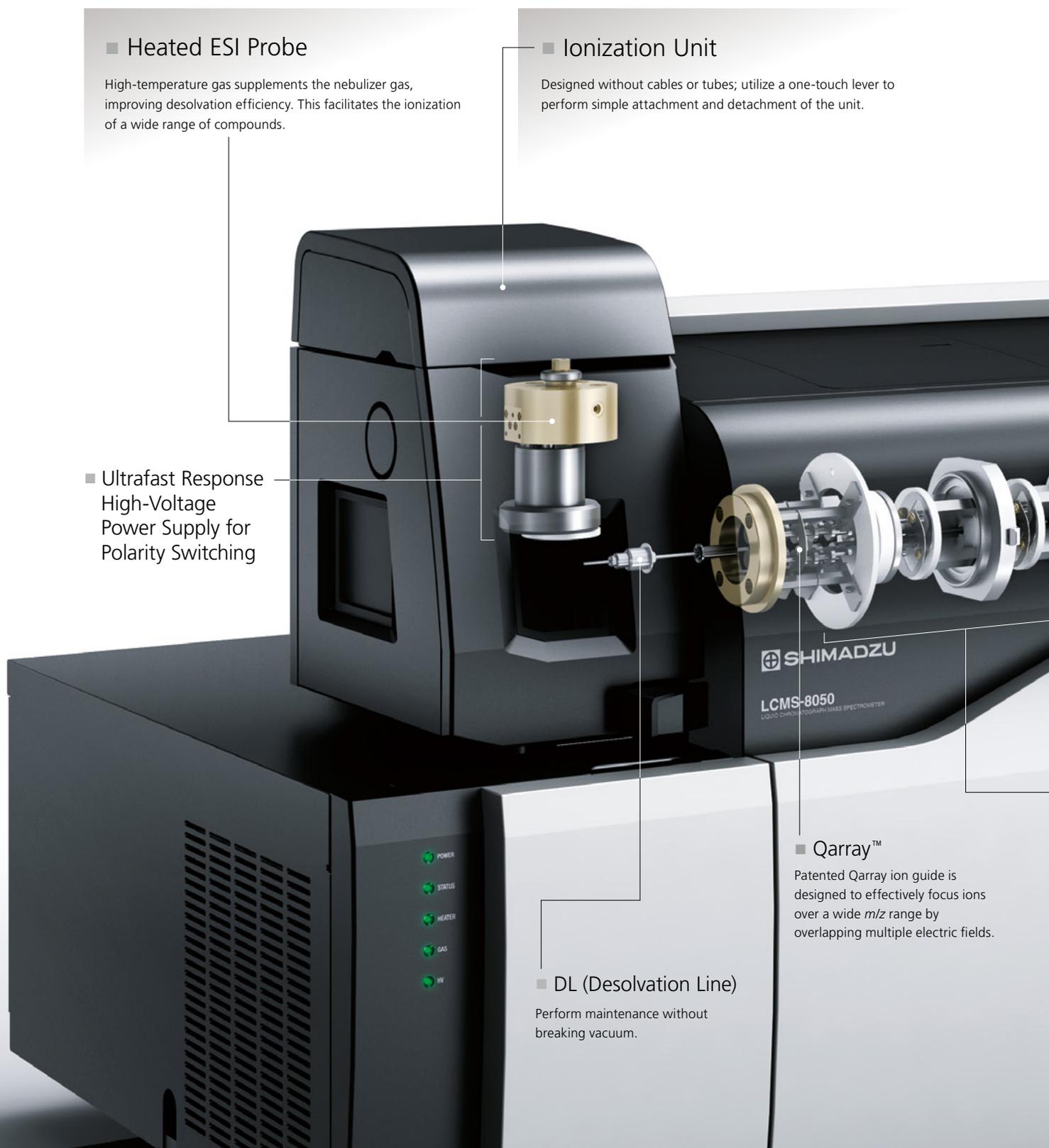
### ■ Ultrafast Response High-Voltage Power Supply for Polarity Switching

### ■ Qarray™

Patented Qarray ion guide is designed to effectively focus ions over a wide  $m/z$  range by overlapping multiple electric fields.

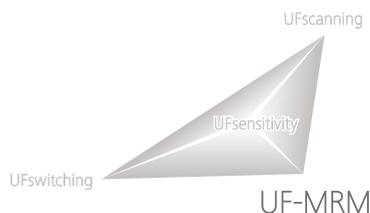
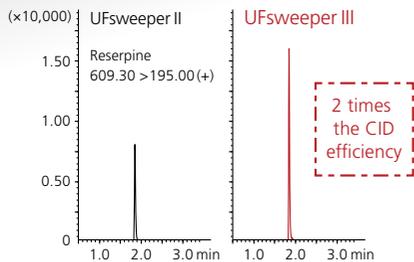
### ■ DL (Desolvation Line)

Perform maintenance without breaking vacuum.



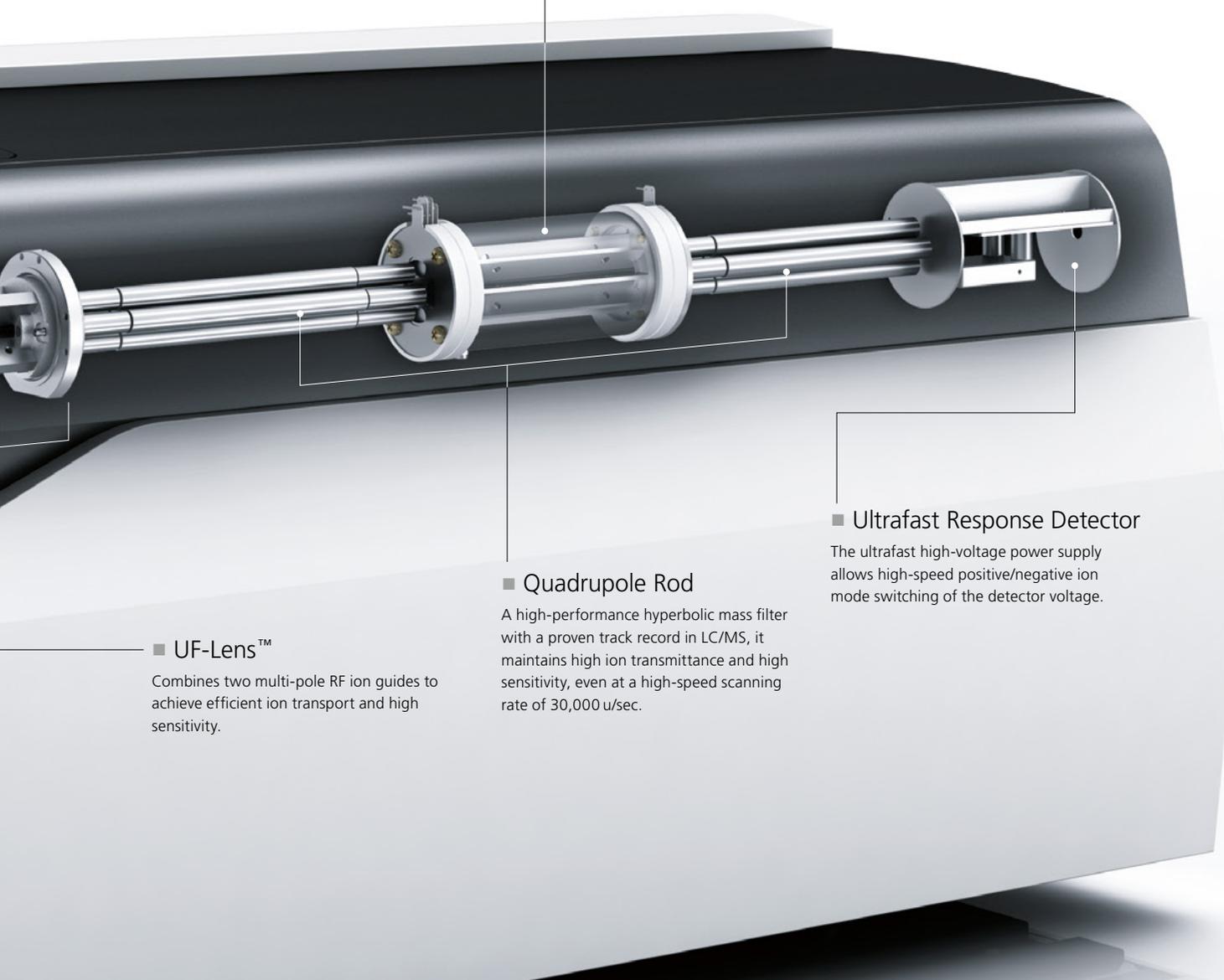
## ■ UFsweeper III Collision Cell

A high-sensitivity, high-speed collision cell, the proprietary UFsweeper III accelerates ions out of the collision cell without loss of momentum. Achieving fast sweeping on successive scans, it offers twice the CID efficiency of UFsweeper II, maintains signal intensity, and suppresses crosstalk, even for high-speed or simultaneous multi-component analysis.



## UF-MRM

UFsweeper III high-speed ion transport technology minimizes ion loss even at a dwell time of 0.8 msec. High-speed MRM transitions up to 555 MRMs/sec accelerate laboratory throughput for simultaneous multi-component analyses.



### ■ UF-Lens™

Combines two multi-pole RF ion guides to achieve efficient ion transport and high sensitivity.

### ■ Quadrupole Rod

A high-performance hyperbolic mass filter with a proven track record in LC/MS, it maintains high ion transmittance and high sensitivity, even at a high-speed scanning rate of 30,000 u/sec.

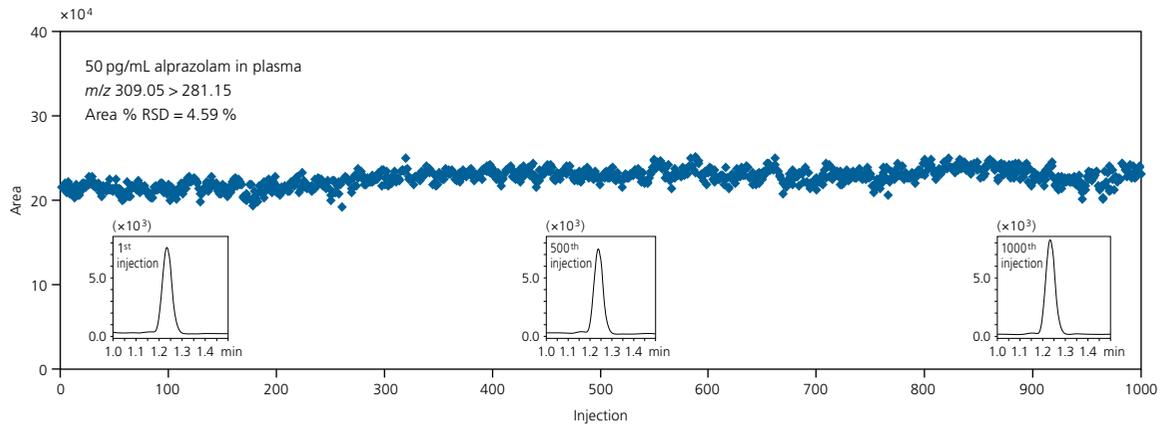
### ■ Ultrafast Response Detector

The ultrafast high-voltage power supply allows high-speed positive/negative ion mode switching of the detector voltage.

# Engineered for Robustness and Easy Operation/Maintenance

## ■ Maintains High Sensitivity Even During Successive Demanding Analyses

In addition to speed and sensitivity, Shimadzu designed the LCMS-8050 for robustness to meet the most demanding laboratory requirements and most difficult matrices. The figure below plots the area results from 1000 consecutive analyses of a deproteinized blood plasma sample spiked with alprazolam. The LCMS-8050 achieves excellent reproducibility with a 4.59 % RSD for the area results over the 1000 analyses.



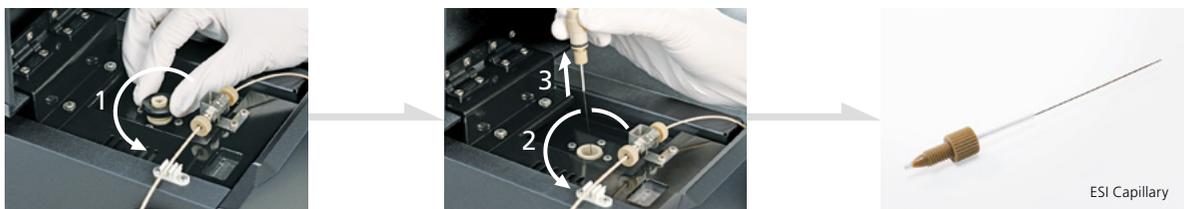
## ■ Easy System Maintenance Reduces Downtime

As with Shimadzu's other triple quad systems, maintaining the LCMS-8050 is simple. Replacing the desolvation line (DL) and ESI capillary is quick and easy. Additionally, the design allows users to replace the DL without breaking vacuum, providing greater uptime and usability.

### ● Steps for DL Replacement

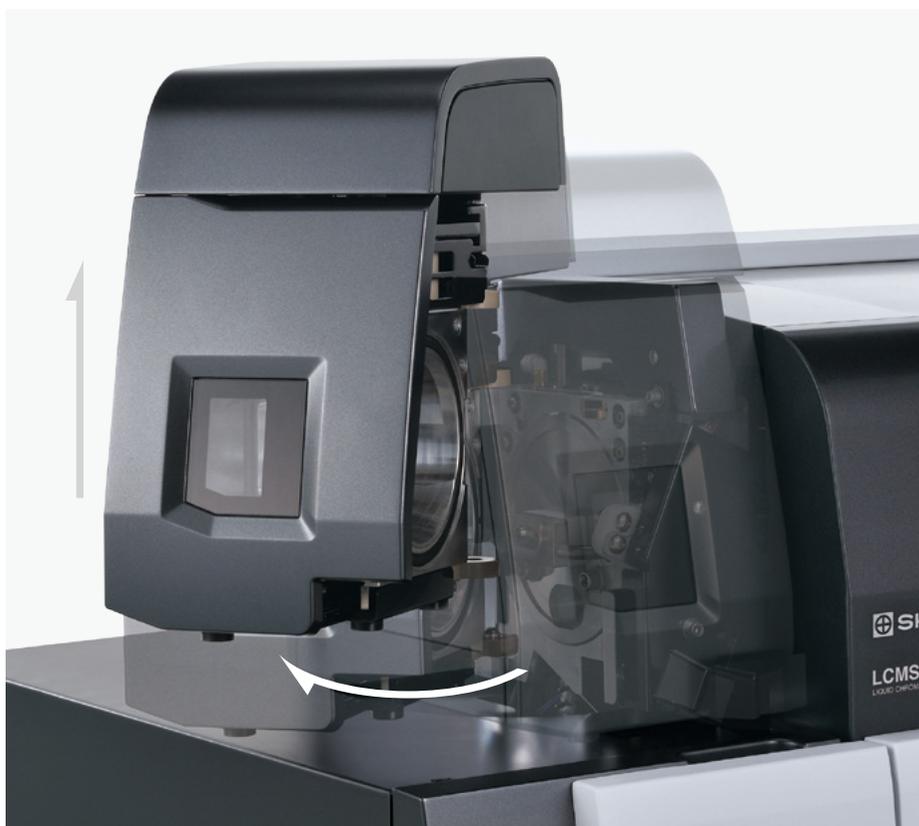


### ● Steps for ESI Capillary Replacement



## ■ Newly Designed Ionization Unit

Designed without cables or tubes, removing the new ionization unit is simple: release a one-touch lever to open the unit and lift it out. In addition, no tools are needed to detach the needles fitted in APCI and DUIS units, allowing for easy maintenance.



ESI-8050 (standard)



APCI-8050 (optional)



DUIS™-8050 (optional)



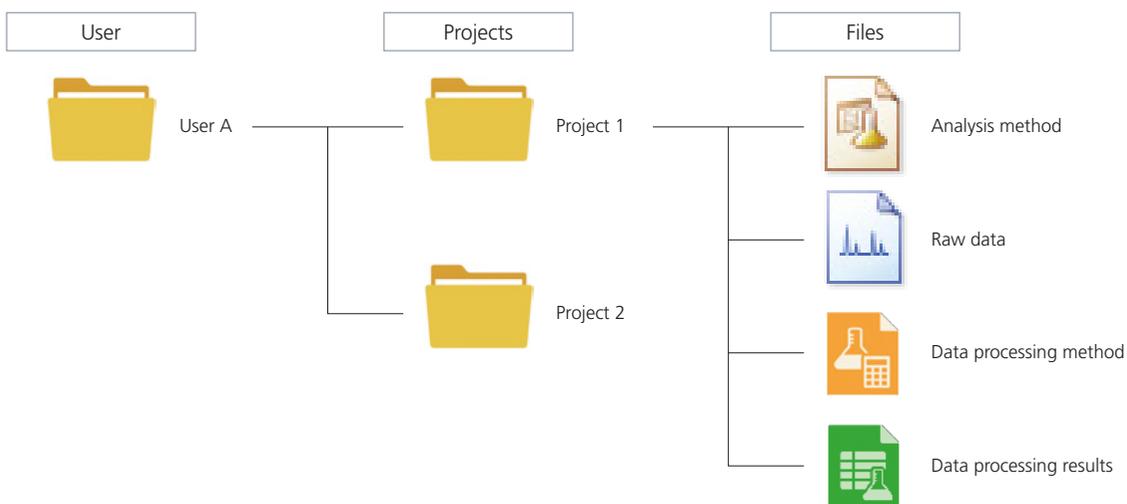
# Software Solutions from Acquisition to Data Review

## LabSolutions Connect™ / LabSolutions Insight™

LabSolutions Connect and LabSolutions Insight provide support for the entire analytical workflow, from optimization of MS conditions to data processing, to achieve maximum efficiency.

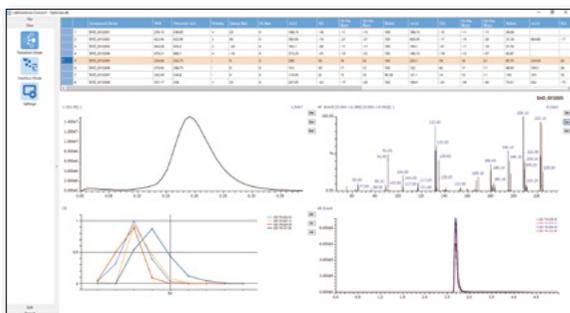
### ■ Project File Management Made Simple

Automatically stay organized with Connect's file management system. File locations are automatically determined by file type, enabling the technician to carry out analysis or data processing without having to remember file paths. Analyte concentrations and other sample results can be saved as a data processing results file. Multiple processing methods can be used on the same data set, with results stored separately, enabling processing parameter optimization and easy results retrieval.



### ■ MRM and Ion Source Optimization

MRM parameters (precursor ion  $m/z$ , product ion  $m/z$ , voltages) and ion source parameters (gas flow rate, temperature) are automatically optimized. Just one round of comprehensive optimization maximizes sensitivity, taking into consideration polarity, adduct ions, charge number etc. The results of this process can be viewed on a graph using the data browser function. The MRM optimization results screen simultaneously displays a chromatogram, a spectrum, and each voltage. From the MRM optimization results screen, check how the signal intensity changes with variations in each parameter.



**MRM optimization**

Review screen for MRM optimization simultaneously displays precursor ion, product ion, and voltage results.

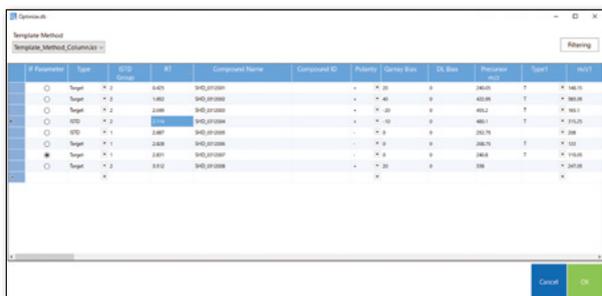


**Ion source optimization**

Review screen for source optimization graphically displays the successive results of each parameter modification.

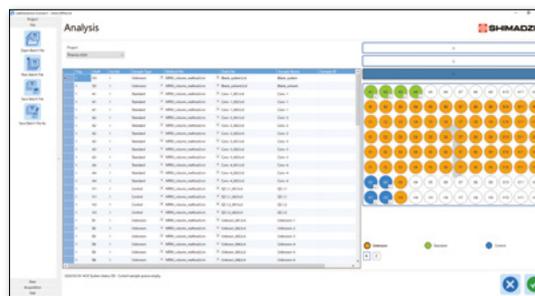
## ■ Simple Method Creation and Batch Creation

LabSolutions Connect organizes optimized results in a dedicated database for easy retrieval. Simply select the target compounds from the database to create a method. Existing method files can be read into the database so that all method file information can be managed together. During the creation of sample acquisition batches, the position of vials is shown on the screen so that settings can be applied easily without risk of mistakes. The project management function prevents the user from accidentally overwriting files from a different project.



Method creation window

Simply select the compounds to be analyzed and the method is automatically generated.



Batch creation window

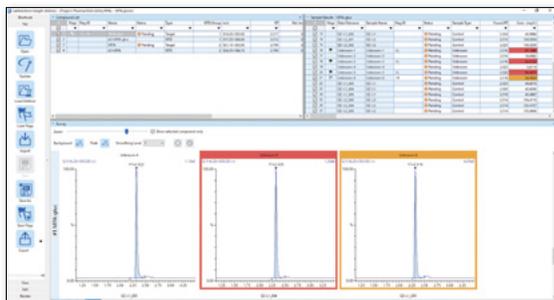
Vial positions and sample types are shown graphically.

## ■ Efficient Data Review

LabSolutions Insight is the ideal environment for sample data review. Toggle between sample and compound review modes based on user preference. The multiple chromatogram display accordingly presents all samples for a particular analyte, or all analytes for a particular sample. All chromatograms can simultaneously be zoomed in or out, or docked in a separate monitor to suit analyst needs.

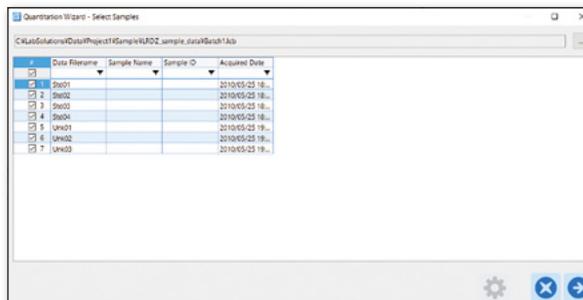
Color-coded flags enable the reviewer to easily spot problem samples for speedy and accurate processing. Flags can be set for a wide variety of QC parameters, not only for values exceeding limits, but also approaching limits. Use standard report templates or file output for universal laboratory information systems integration.

Smart Data Reduction mode supports not only data files from previous LabSolutions versions, but also the new raw data format Irdz. Compared to past formats, Irdz file sizes are 80% smaller. These files can be processed with LabSolutions Insight, and the results are stored as an iproc file.



Multi-chromatogram survey display

Easily carry out peak corrections for multiple chromatograms, and use the flagging function to keep track of samples that need to be checked.



Sample selection screen in Irdz file

Select and quantitate the samples in Irdz file in Insight Wizard. The result will be saved in iproc file.

# Compound Identification

## LabSolutions Insight Library Screening

LabSolutions Insight offers MS/MS library search capabilities. Instrument parameters and MS/MS library spectra are available to deliver faster data acquisition, higher data quality, and enhanced identification. Shimadzu's LabSolutions Insight software offers easy viewing of the compounds of interest, including structural information, retention time and library similarity score. LabSolutions also enables you to produce

high-quality results without the need to define a threshold value to trigger a spectrum, decreasing the chance of false negative reporting. This feature, MRM Spectrum Mode, acquires all compound fragments of interest in MRM mode and can be used to create accurate spectra from even trace concentrations.



Example of the screening of veterinary drugs using MRM spectrum mode

In MRM Spectrum Mode, known compound fragments are selectively acquired using multiple MRM channels, enhancing signal for low abundance analytes. Shimadzu's ultra-fast quadrupole technology makes this a practical approach for large panels of analytes.

### ■ LC/MS/MS Method Packages and MRM Libraries

Shimadzu offers a wide variety of method packages containing LC separation conditions and a number of predetermined MRM conditions. Laboratories can bypass time-consuming method development steps and realize results sooner.



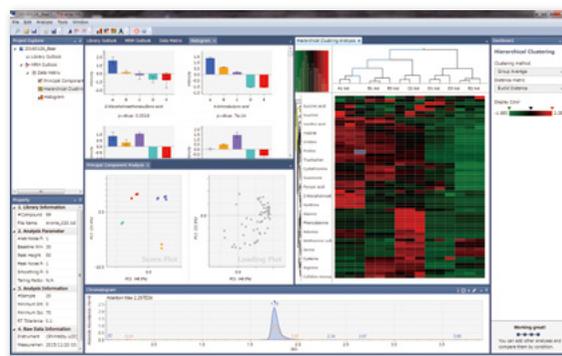
	Description	Flyer code	Description	Flyer code
Method Packages	Residual Pesticides	C146-E348	Short Chain Fatty Acids	C146-E355
	Veterinary Drugs	C146-E161	Mycotoxins	C146-E351
	Water Quality Analysis	C146-E180	Aminoglycoside Antibiotics	C146-E352
	Rapid Toxicology Screening	C146-E398	Restricted Chemicals in Textiles	C146-E382
	Primary Metabolites	C146-E437	Forensic Toxicology Database	C146-E344
	Lipid Mediators	C146-E381	Bile Acids	C146-E428
	Cell Culture Profiling	C146-E279	Modified Nucleosides	C146-E441
	D/L Amino Acids	C146-E336		
MRM Libraries	Metabolic Enzymes in Yeast	C146-E275	Phospholipid Profiling	C146-E314

Note: Check your local sales office to learn which packages are compatible with each LCMS model.

### ■ Traverse MS™

Multivariate Analysis Software

Traverse MS data analysis software enables multivariate analysis of high complexity data in the field of metabolomics. Both Shimadzu GCMS and LCMS MRM data can be analyzed to align, identify, and quantitate component peaks. Large sample sets can be displayed graphically, statistical analysis can be performed, and metabolite pathways can be mapped.



\* Traverse MS is provided by Reifycs Inc.

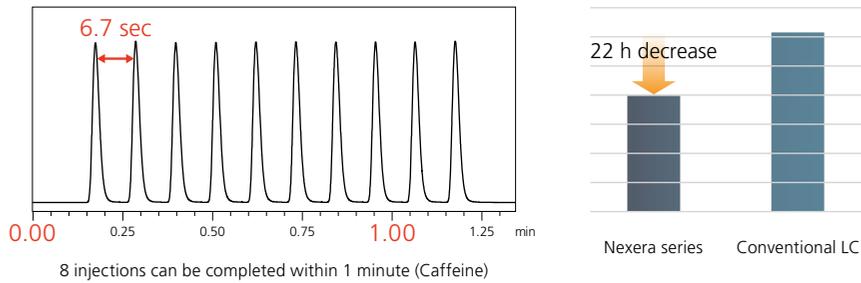
# Nexera UHPLC

Our unique approach to delivering high-quality, high-speed LC/MS/MS analysis is combining the Nexera UHPLC and LCMS-8050 as a seamlessly integrated system.

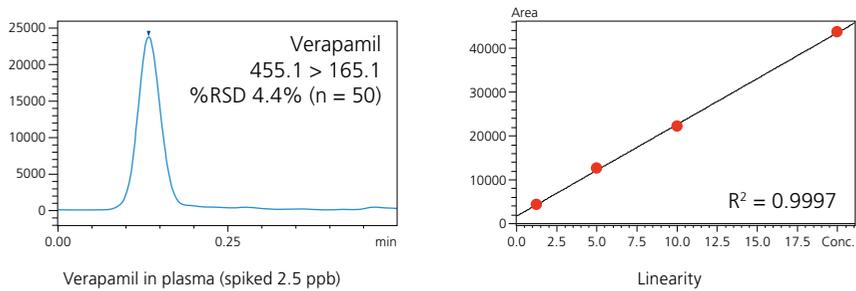


## ■ Analysis Cycle Time Less Than 10 Seconds

The SIL-40 autosampler can process the entire injection cycle time in as little as seven seconds, twice as fast as the previous model. In addition, continuous analysis can be carried out on up to 44 MTPs (using 3 PLATE CHANGERS). Together these features dramatically increase analysis throughput.

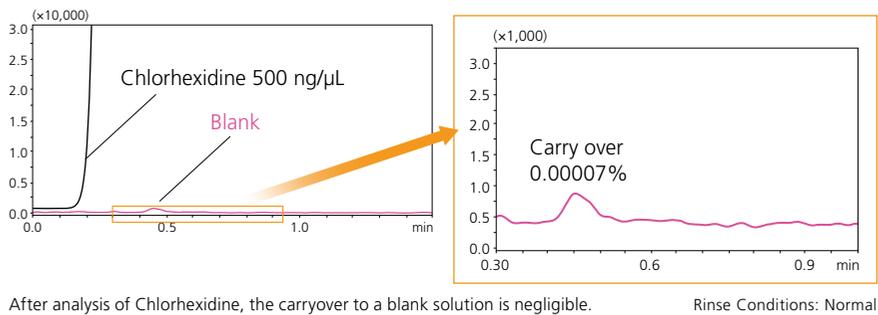


Pharmacokinetic analysis requires not only speed but also high reliability at low concentrations. With its ultra-fast injection and ultra-low carryover, the SIL-40 autosampler delivers high reproducibility and reliability, even during an ultra-fast 30-second analysis.



## ■ Ultra-low Carryover

The Nexera boasts ultra-low carryover, even on a high-sensitivity LC-MS/MS. This reduces time spent on rinsing, resulting in a shorter overall analysis time.



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